INVESTIGATING PLACE-BASED PEDAGOGY UTILIZATIONS IN CURRICULAR PRACTICES

A Thesis

by

NIKEITHA LYNN BROWN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTERS OF SCIENCE

December 2011

Major Subject: Curriculum and Instruction

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Approved by:

Chair of Committee,	Mary M. Capraro
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ABSTRACT

Investigating Place-based Pedagogy Utilizations in Curricular Practices.

(December 2011)

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Outlets for students to develop mathematical ideas and skills to solve real-life problems and applicable situations have been neglected in secondary classrooms. Designing curricula that applies real-life situations has been promoted and also is an expectation of state standards for student learning. Contrary, evidence has shown low benefits to classroom real-life examples perceived by students.

This study served dual purposes: 1) Determine the relationship between place-based education and mathematics learning, and 2) Investigate teacher conceptions of place-based education opportunities in high school, mathematics curriculum. This study employed two methodologies. A mixed-methods approach was employed for the meta-analysis of place-based programs and the second employed qualitative methods of structured interviewing to determine teachers' conceptions of place-based pedagogy. Upon completion of the study, I concluded: 1) Place-based pedagogies align toward more foundational mathematic skills (e.g. measurement, number sense) when implemented, and 2) Teachers' conceive place-based as a general effective tool for student engagement and real-world context of how mathematics functions in society.

DEDICATION

This thesis is a tribute to me, Nikeitha Lynn Brown, for the tenacious effort and attitude of surmounting all impediments, the tears and the laugher, endured during my graduate school journey. During my master's program at Texas A&M University, I have truly persevered and sustained my integrity, values and determination to achieve my ambitious goals set forth. I feel truly blessed to have lived and survived the experiences of a master's program with a thesis concentration (emphasis on thesis). I send the highest and noteworthy accolades to my biggest cheerleader, God; I can do everything through him who gives me strength (Philippines 4:13).

ACKNOWLEDGEMENTS

I would like to express sincere gratitude to my committee chair, Dr. Mary M. Capraro as well as my committee members Dr. Robert M. Capraro, Dr. Patricia J. Larke, and Dr. Jim J. Scheurich. Thank you for your endless patience and guidance through the course of the thesis process. To the Capraros - thank you for providing “tough love” when I needed it and for your willingness to offer help at anytime. Thank you to my chair and committee again for allocating your time and sharing your expertise to a novice researcher like me.

Also, special thanks to my family for truly believing in me and encouraging me through this challenging process. Your prayers have been a blessing. To my Aunt Ellen, thank you for acting as my persistent alarm system through the final stages of this process and for always offering your most candid suggestions.

In addition, I would like to thank my friends in College Station, whether classmates, colleagues, fellow Aggie graduate students, and professors for your words of encouragement and sharing your stories. Thank you to my counselor for always willing to listen and to make meaning from my feelings and encouraging me to be more optimistic about my role as a novice researcher.

Thank you to the participants of this study for volunteering your time and sharing your voice.

Finally, to my entire support system, I definitely could not have achieved (well come this far) this colossal, monumental stage of my life without you! With love, thank you immensely.

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CHAPTER I

INTRODUCTION

Authentic activities to explore the utility of mathematics in more than real-life examples cited in a textbook and abstract concepts is imperative for students to learn subject content instead of merely about them (Brown, Collins & Duguid, 1989). Smith and Girod (2003) have argued US teachers generally "receive" curricula as disseminated materials, with little restructure or modifications. These authors support integrating student experiences with the ideas and tools of the discipline, as long as neither is compromised. When real-life connections are explicit, students are able to transfer their knowledge and skills to other context or testing situations (Fuchs et al., 2003). Place-based pedagogy emerged as a solution to the absence of opportunities to engage in real-life utilities of subject content (Sobel, 2004). Authentic learning opportunities in the community help students make sense of the symbolic and abstract ideas of mathematics education (Brown et al., 1989; Cognition and Technology Group at Vanderbilt, 1990).

Problem Statement

Outlets for students to develop mathematical ideas and skills to solve real-life problems and applicable situations have been neglected in secondary classrooms (Gainsburg, 2008). Designing curricula that applies real-life situations has been promoted by the National Council of Teachers of Mathematics (2000), the National

This thesis follows the style of *Journal of Mathematics Teacher Education*.

Research Council (1998), and the Commission on Behavioral and Social Sciences and

Education (2000) and also is an expectation of state expectations of student learning (Texas Education Agency, 2009).

Contrary, evidence has shown low benefits to classroom real-life examples perceived by students. Often, secondary mathematics education diverges from everyday life and technical applications, nevertheless creating quantitative situations that embody everyday situations and commonalities across cultures is the challenge inherited by teachers (Smith & Girod, 2003).

There exists a disparity between experienced real-life examples and class explanations of real-life examples of student conceptions (Baki et al., 2009). Dewey, an early philosopher of experiential learning, believed the integration of common activities of society was a critical process of student understanding (Fott, 2009). Advocating the term "psychologizing" as the method to achieve student understanding where teachers reinterpret the fundamental concepts and method of subject content (Smith & Girod, 2003). Making connections are an integral process of learning; the brain seeks patterns or ways to construct meaning (Baki et al., 2009). Where knowledge is coproduced in situations through activities (Brown et al., 1989), creating relevant, powerful lessons where sufficient attention is focused on understanding the experiences (Smith & Girod, 2003).

Placed-based education (PBE) progressively emerged as an alternative to traditional schooling where students were grounded in local issues and experienced full-body learning in the communities they dwell (Smith, 2002). Learning is grounded in a sense of locale through inquiry methods. Dewey originated the merge of "school and society" where students construct meaning in their local environments through investigation of the natural and human communities (Woodhouse & Knapp, 2000). Students are more likely to develop "real-world" skills by working on projects of value to the community in place-conscious curriculum (Powers, 2004). Useable skills in real-life content are the aim of school, not standardized testing (Stone, Alfeld & Pearson 2008; Schlechty, 1997).

Place-based learning deviates from class practices which involve rote, minimalist norms where opportunities for cognitive reflection of individual meanings among culture and place are nonexistent (Gruenewald, 2003). Learning in place exceeds beyond a euphoric "feel good" moment (Gonsalves, 2010) and engages students in the real-life relevance of subject matter within their communities.

With the arrival of statewide accountability and standards, real-world examples in mathematics education are an essential component of content mastery. Gainsburg (2008) outlined some examples of real-world context of mathematics education literature:

• simple analogies (e.g., relating negative numbers to subzero temperatures)

• classic ‘‘word problems’’ (e.g., ‘‘Two trains leave the same station…’’)

• the analysis of real data (e.g., finding the mean and median heights of classmates)

• discussions of mathematics in society (e.g., media misuses of statistics to sway public opinion)

• ‘‘hands-on’’ representations of mathematics concepts (e.g., models of regular solids, dice)

• mathematically modeling real phenomena (e.g., writing a formula to express temperature as an approximate function of the day of the year).

Students are expected to connect mathematics to life beyond school. Because real-world connections represent sophisticated mathematical thought , benefits of this skill include enhancing students’ understanding of mathematics concepts (Steen & Forman, 1995), motivating mathematics learning (National Academy of Science, 2003) and helping students apply mathematics to workplace settings (National Research Council, 1998). However, workplace mathematics is more challenging to locate when standard school curriculum is solely implemented (Nicol, 2002). The absence of created, explicit connections inhibits student ability to transfer knowledge and skills outside the classroom, whether it is to another context or to an abstract testing situation (Stone, Alfeld, Pearson, Lewis, & Jensen, 2005). If students remain deficient in the area of making real-world connections, an under-optimized workforce will be the result (Stone et al., 2005).

Purpose Statement

I have advanced my knowledge of place-based education (PBE) relationships to mathematics learning and investigated teacher conceptions of place-based education opportunities in high school, mathematics curriculum within a two article format.

The first article (Chapter II) employed meta-analytic procedures to investigate PBE programs and their effects on student learning, particularly mathematic cognition.

Research of place-based education provides evidence of benefits of student attitudes and aptitudes in varied subject areas. Place-based education and outdoor education share some identical methodologies. Outdoor education is a subset of PBE where students explored "contextual experiences in natural and constructed environments" (Woodhouse & Knapp, 2000, p.1).

The second article (Chapter III) questioned teachers' conceptions of implementing place-based pedagogy in high school, curricular practices. Secondary mathematics concepts are usually regarded as abstract and irrelevant to real-world context. Gainsburg (2008) argued a low priority has been placed on developing students' ability and disposition to recognize applications in real-life context in secondary, mathematics. Smith and Girod (2003) also believed secondary education curriculum has remained standard.

Collectively, the researcher intent of the articles proposed is to strengthen the relationships of real-life, mathematical pedagogy in high school. Publicized, explicit connections to reality has enhanced teacher knowledge of the interconnections of mathematics to societal practices as well as improved student mathematic functionality. Programs such as Career and Technical Education (CATE) program have supported more organic curricula, incorporating explicit mathematical lessons where they naturally occur (Stone et al., 2005). However, as an elective, the CATE program limits student access to rich mathematic content.

CHAPTER II

IS PLACED-BASED EDUCATION WORTHWHILE? THE META-ANALYSIS

Teachers' roles have been restructured to enable diverse students to construct their own knowledge and develop their talents in the most influential ways (Darling-Hammond, 1997). Smith and Girod (2003) have argued US teachers generally "receive" curricula as disseminated materials, with little restructure or modifications. These authors support integrating student experiences with the ideas and tools of the discipline, as long as neither is compromised. When real-life connections are explicit, students are able to transfer their knowledge and skills to other context or testing situations (Fuchs et al., 2003). Place-based pedagogy emerged as a solution to the absence of opportunities to engage in real-life application of subject content (Sobel, 2004). Where resources such as schoolyards, communities, public lands and other content enriched places become the hub of classroom learning.

Literature Review

Insidious Configurations in the Classroom

Outlets for students to develop mathematical ideas and skills to solve real-life problems as well as applicable situations have been neglected in secondary classrooms (Gainsburg, 2008). Designing curricula that applies real-life situations has been promoted by the National Council of Teachers of Mathematics (2000), the National Research Council (1998), and the Commission on Behavioral and Social Sciences and Education (2000) and also is an expectation of state expectations for student learning (Texas Education Agency, 2009). Contrary, evidence has shown low benefits to classroom real-life examples perceived by students. Often, secondary mathematics education diverges from everyday life and technical applications; nevertheless creating quantitative situations that embody everyday activities and commonalities across cultures is the challenge inherited by teachers (Smith & Girod, 2009).

There exists a disparity between experienced real-life examples and class explanations of real-life examples of student conceptions (Baki et al., 2009). Dewey, an early philosopher of experiential learning, believed the integration of common activities of society was a critical process of student understanding (Fott, 2009). Dewey advocated the term "psychologizing" as the method to achieve student understanding where teachers reinterpret the fundamental concepts and method of subject content (Smith & Girod, 2003). Making connections are an integral process of learning; the brain seeks patterns or ways to construct meaning (Baki et al., 2009). Where knowledge is coproduced in situations through activities (Brown et al., 1989), creating relevant, powerful lessons where sufficient attention is focused on understanding the experiences (Smith & Girod, 2003).

Mathematics Sustains Relevant

Mathematics has been stigmatized as abstract and irrelevant rather than crediting math as a necessary tool for problem solving (Stone et al., 2008). While many external stakeholders have found that secondary mathematical courses were practical in the workplace, employers have expressed that Algebra I skills, such as the ability to express problems as equations, and fluency with fractions and decimals, were paramount (Stone et al., 2005). Sorensen (2000) argued math was nowhere to be found although it was everywhere in our lives; it was nowhere to be seen. The state of invisibility was a result of neglecting mathematical understanding and structures; consequently mathematics was hidden and implicit throughout society (Nicol, 2002). Researchers concluded that an incongruence existed between mathematical models conceptualized by practitioners for work and classroom mathematics used by nurses, bank employees, and commercial pilots (Nicol, 2002; Noss, Hoyles, & Pozzi, 2000). Even grocery shopping lacked resemblance of mathematics learned in the classroom (Hartsell, Herron, Fang, & Rathod, 2009).

Contrarily, mathematics was shown to be relevant by the Primes project, where families problem solved and engaged in troubleshooting as part of their daily discourse for a substantial portion of family activity (Goldman & Booker, 2009; Goldman, Martin, Pea, Booker, & Blair, 2006). Mathematical relevance has shown to be an important factor but students are still mathematically disconnected throughout secondary schooling and even college courses.

A Quantitative Deficiency

Many new college students enroll in multiple remedial (no credit earned) courses as preparation for college-level course work. Taking remedial courses was financially costly and time intensive for both student and institution (Venezia, Kirst, & Antonio 2003). The need to take remedial coursework could be the result of fragmented knowledge that stemmed from poor-high school achievement. The 2000 National Assessment of Educational Progress (NAEP), found only 2% of U.S. students attained advanced levels of mathematics achievement by 12th grade (National Center for

Education Statistics, 2005). More recently, the 2005 NAEP results indicated less than one quarter (23%) of 12th-grade students performed at or above a proficient level on the mathematics portion of the test (Griggs, Donahue, & Dixon, 2007). A reason for the low percentage of performance could have been because US teachers tended to focus on low-level mathematical skills when compared to higher achieving countries (Hiebert et al., 2005; Stone et al., 2008). Student disengagement coupled with their feelings of mathematical irrelevance to life after high school was also additionally associated with low student achievement (National Council of Teachers of Mathematics [NCTM], 2000).

Classroom "interplay between mathematics and reality or real-world modeling and problem solving is not transferred beyond school territory" (Bonnotto, 2003, p. 8). Often students were unequipped with the knowledge to apply their classroom learning to differing contexts, commonly referred to as *inert knowledge* (Pugh &Bergin, 2005). The absence of created, explicit connections inhibited student ability to transfer knowledge and skills outside the classroom (Stone et al., 2005). Conceivably, inert knowledge may be the long-term effect of the classroom teacher. Initial learning should include certain qualities to achieve transferability beyond the school grounds (Pugh & Bergin, 2005).

Curriculum Reforms Surface

Advocates of the Career and Technical Education (CATE) program supported more organic curricula, incorporating explicit math lessons when they naturally occur

(Stone et al., 2005). The effects of student achievement assessed by the CATE program reported:

- 73% of students make more sense out of their answers and were able to transfer to other context;
- 92% saw math a tool they use to quantify the world and analyze the world around them;
- 89% math skills benefited: improved understanding of math concepts, better mastery and retention, valuing and more enthusiasm about math (Lieberman & Hoody, 1998, p. 5).

These results affirmed the impact of an authentic, environment-based curriculum. However, the challenge with authentic, contextual learning is that "knowledge was dependent upon and embedded in the context and activity in which it is acquired and used" (Karweit, 1993, p. 54) and may not be transferable to other contexts. Fuchs et al. (2003) argued classroom transferability was feasible in an organic curriculum if students learn the abstract principles behind the context and are guided through other applicable, conceptual examples. A math teacher shared that when students utilized measurement skills on a nature trail, they were better able to apply the math skills longer as compared to measuring in the classroom (Lieberman & Hoody, 1998). Indeed, expert performance is characterized by an ability to adapt ones' skills to novel situations and actively solve problems (Ericsson & Charness, 1994; Stone et al., 2005). Other curricular, reformist approaches to reducing the education gap, promoted *place-based education* (PBE).

Placed-based education (PBE) progressively emerged as an alternative to traditional schooling where students were grounded in local issues and experienced full-body learning in the communities they dwell (Smith, 2002). Learning is grounded in a sense of locale through inquiry methods. Students internalized an affective bond through direct experience and an intimate engagement with a place; also termed place attachment (Semken & Freeman, 2008). Dewey originated the merging of “school and society” where students construct meaning in their local environments through investigation of the natural and human communities (Woodhouse & Knapp, 2000). Students are more likely to develop “real-world” skills by working on projects of value to the community in place-conscious curriculum (Powers, 2004). Useable skills in real-life content are the aim of school, not standardized testing (Schlechty, 1997; Stone et al 2008).

Place-based learning deviates from class practices which involve rote, characterized by minimalist norms where opportunities for cognitive reflection of individual meanings among culture and place are nonexistent (Gruenewald, 2003). Learning in place exceeds beyond a euphoric “feel good” moment (Gonsalves, 2010) and engages students in the real-life relevance of subject matter within their communities. Students indulge themselves in projects tailored to their local realties and people.

With the arrival of statewide accountability and standards, real-world examples in mathematics education are an essential component of content mastery. Students are expected to connect mathematics to life beyond school. Because real-world connections represent sophisticated mathematical thought, benefits of this skill include enhancing students’ understanding of mathematics concepts (De Lange 1996; Gainsburg, 2008), motivating mathematics learning (National Academy of Science, 2003) and helping students apply mathematics to workplace settings (National Research Council, 1998).

However, workplace mathematics is more challenging to locate when standard school curriculum is solely implemented (Nicol, 2002).

Methodology

Meta-analysis has multiple functions: direct future research more effectively (Light 1979; Mullen & Rosenthal, 1985), increase accessibility of research audience (Cooper & Rosenthal, 1980; Mullen & Rosenthal, 1985), and conceptualize and theorize evidence more precisely (Fiske, 1983; Mullen & Rosenthal, 1985). In retrospect, meta-analysis provides a method for synthesizing the overall effects of various studies in a standardized approach (Neils, 1997). Reported inconsistencies and gaps from placed-based literature groups will be compared and combined to yield fresh results that are consistent with or different from previous reported results thus becoming more credible. The intent of this meta-analysis was to determine the relational strength between PBE and student performance. Of particular interest was cognition and mathematics learning. Set parameters reduced the PBE literature compatible to this study.

A widespread literary search was be conducted through PsycLIT, ERIC, ProQuest, and Google Scholar databases. In addition, the Place-Based Education Evaluation Collaboration (PEEC) and Promise of Place will serve as a hub for PB literature and resources such as conference proceedings and program evaluations. PBE studies will be selected according to the following criteria: a) included an empirical protocol, b) community involvement with cognitive learning opportunities, and c) intervention settings located within US boundaries. Studies will be classified as qualitative or quantitative. Of the 10 studies, five studies were classified as qualitative and five as quantitative. The selected studies ranged from 1990 - 2004 and consisted of various PBE programs and subject areas. Because of these varied PBE research, a mixed methods approach was applied.

Quantitative Coding

The results from five, PBE studies were analyzed, where correlations, inconsistencies, and gaps were identified. Microsoft Excel was used to calculate statistical measures used in the meta-analysis. The results were reported in terms of effect size using Cohen's *d,* representing the quantified amount of change between PBE and student performance. Thus, the magnitude of effects was examined across studies. A Cohen's *d* was computed using means, sample size, and standard deviation from experimental and control groups. Additionally, ANOVA eta-squared values were converted to Cohen's *d*. Effect sizes of .33 served as the standard benchmark for PBE educational program effectiveness. Once effect sizes and confidence intervals were reported for each factor, all components were categorized to determine the relationship between PBE programs and student performance. Confidence intervals were computed from standard deviations of each component. The 95% Confidence Intervals (Cumming & Finch, 2001) were constructed then compared graphically using error bars. Statistical significance was interpreted using overlap $\leq$50%. Dissimilar sample sizes could cause bias. Bias was alleviated by aggregating sample size into population sums and across studies these sums were used.

The Qualitative Approach

A qualitative systematic approach was incorporated to determine the relationship between PBE programs and student performance. The results and conclusion of five PBE studies were selected for qualitative analysis. These studies included were: Lewicki (2000), Emekauwa & Williams (2004), Baker (1990), Gonsalves (2010), and Powers(2004). As the data was read it was simultaneously open coded. These codes helped segment the data into categories: setbacks, outcomes, suggestions, community, needs, staff, confidence, and curriculum. Properties from each category were assigned axial codes, which signified distinctions. A matrix was created to illustrate the emergent themes among PBE research. Lastly, selected codes generated a theory that described the relationship between PB educational programs and student performance. The subsequent section reports the findings of both approaches, quantitative and qualitative.

Results

Quantitative Analysis

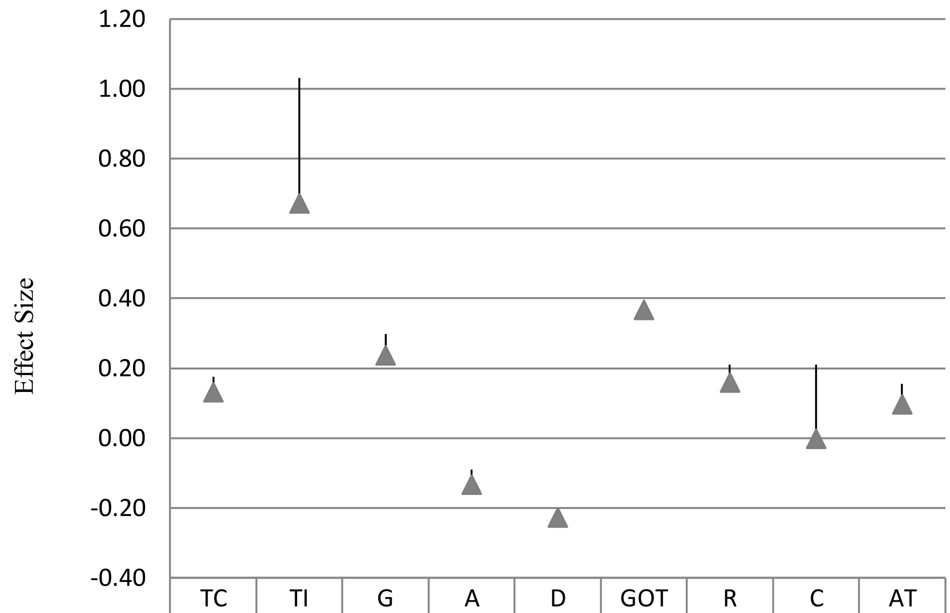
The aggregated studies identified nine factors that influenced student performance (see Table 1). These factors were teacher confidence, teacher implementation, student attendance, student discipline, student grades over time, student responsibility, student culture, student attitude, and student grades as shown in Figure 1. The findings were clustered into four variances: large, medium, small and insignificant.

Table 1 *Summary of Quantitative Paced-based Studies*

Factor	Mean Effect Size	CI	SD	N Studies	N Participants
Teacher Confidence	0.15	0.02	0.05	1*	20
Teacher Implementation	0.85	0.18	0.41	1*	20
Attendance	-0.11	0.02	0.29	2*	722
Discipline	-0.22	0.01	0.04	1*	230
Grades Over Time	0.38	0.01	0.11	1*	230
Responsibility	0.18	0.03	0.20	1*	230
Culture	0.10	0.11	0.33	1*	37
Attitude	0.13	0.03	0.23	1*	230
Grades	0.27	0.03	0.35	2*	515

*Indicates less than 3 studies for meta-analysis.

Fig. 1 *Summary of Confidence Intervals*



	TC	TI	G	A	D	GOT	R	C	AT
Upper Confidence Limit	0.17	1.03	0.30	-0.09	-0.22	0.40	0.21	0.21	0.16
Mean Effect Size	0.15	0.85	0.27	-0.11	-0.22	0.38	0.18	0.10	0.13
▲ Lower Confidence Limit	0.13	0.67	0.24	-0.13	-0.23	0.37	0.16	0.00	0.10

Note. TC=teacher confidence, TI=teacher implementation, A=attendance, D=Discipline, R=Responsibility, CI=confidence interval, and SD=standard deviation

Teacher implementation revealed the greatest impact on student performance. Student grades showed a moderate positive effect. Teacher confidence, student responsibility, and student attitude yielded small, positive variances; a latent effect on student performance. Grades over time showed the smallest, positive effect size. The remaining categories, student attendance (negative effect size), student discipline, and student culture displayed confidence intervals that included zero. These variances were insignificant and had no influence on student achievement. The categories of responsibility and attitude were statically significant.

Constant-Comparative Analysis

Several themes emerged from the constant comparative analysis approach to the qualitative data. These themes included community, investment, and curriculum.

Aura of Community. Community in PBE refers to two merged entities, local allies and the classroom. The community permitted access to PBE opportunities hence becoming an outpouring of resources, support, and facilities; a forum for learning. Resources included local bakeries, nonprofit organizations, and national parks. Local allies were represented by a network of entrepreneurs, field specialists, and industries. Community also comprised students' family members, neighbors, and friends who acted as PBE benefactors. Educators and local allies built a fiduciary partnership. A placed-based educator shared "kids are interested in going outside of school building and learning within the context of their environment". Relationships along with a shared, well-defined vision were imperative to PBE project success.

Investment. This theme is described as a teacher's commitment to the profession to serve as PBE facilitators. Effective facilitation demanded extensive training and continuous collaboration among educators, both within grade level and across grade levels. Trainings had two components: placed-based framework and distinctive program competencies. A few training examples were Project I, PEEC, and Rural School Based Enterprises. Trainings offered instrumental resources for workshop planning, didactic and administrative skills. Continuous, active-learning sessions offered assistance with materials and data processing. The explicit practice in standard-based units induced understanding and thus empowered educators. A participant shared "I'm more confident, I'm taking more responsibility, and have a higher level of maturity when working outdoors." This magnified confidence, empowered educators to assume leadership roles. A participant narrated "it enabled me to go speak at public town meetings about the outdoors", "I was confident in what I was doing." The psychological investment in PBE created a sense of responsibility amongst educators that shared a well-defined purpose.

Curriculum. A curricular blueprint was the last emergent theme of PBE projects.. This curricular blueprint influenced if not determined the community site for PBE. The process started with an examination of the current curriculum. Educators perused for units that were more complementary to PBE learning. A student expressed, "Learning is caring and finding the truth in something that you can't see." Students were granted the opportunity to make "serendipitous connections." A student shared, "When you get to create your own map, it's a lot more interesting than just creating something from a book. A book is kind of interesting, and you are learning, but when you are doing it, you learn more and you can remember it." External and internal challenges were anticipated throughout the selection process. The final design required a project with clear guidelines that promoted student self-regulation and was realistically feasible. "We must be the partners rather than the patrons of the students" described an educator.

Intervening PBE Conditions. Some other factors which teachers the mentioned that were necessary for successful implementation of PBE are noted here. Thus, teachers noted that certain conditions were imperative for quality PBE. These conditions were broad and specific situational factors that influenced the casual conditions and resulted phenomenon. These factors include: a) time constraints, b) learning curve, c) placed-based logistics, d) financial support, and e) additional adult supervision. Allocating adequate time for PBE curricular planning, training and implementation increased the livelihood of the program. Programs assessed student knowledge periodically throughout the program and discovered a learning curve. The learning curve illustrated an increase of student knowledge during the earlier stages then a gradual retention of new knowledge as the program progressed. Educators need to proactively develop strategies to maximize student learning for the duration of the program.

Other PBE related conditions arose during implementation such as program logistics, financial budgeting and additional supervision. These conditions were major in launching a PBE program and required delegation. Some logistics included developing community contracts, coordinating buses and permission slips, and preparing students' conduct for community interaction. Adequate adult supervision was a critical insurance for student safety. The amount of work involved during PBE was unrealized by many educators. Participants suggested that half-time teaching positions were additionally created for PBE programs. Augmented financial budgets played a pivotal role in PBE decision-making and program success.

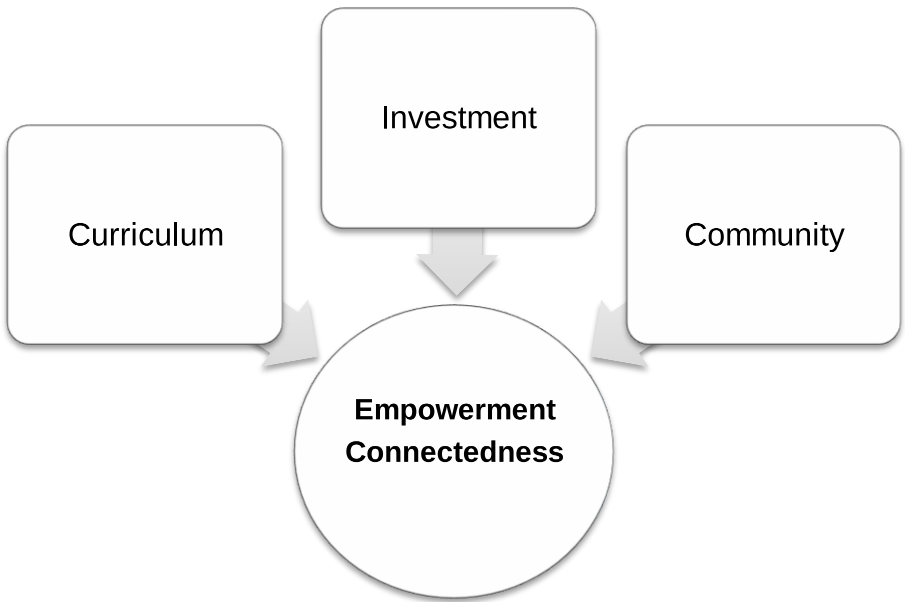
Discussion and Recommendations

The initial purpose of this study was to determine the strength between PBE programs and student performance. The standardized findings from the quantitative research indicate a moderate strength exists between PBE programs and student achievement. This strength magnitude is highly contingent upon teacher implementation. Massive, stringent trainings were a huge component of student achievement. Contrary to Sorensen (2000), mathematics was embedded in communities practices and was explicit. Savant PBE educators are the catalyst for student academic growth. Whether a PBE effect on student achievement far exceeds conventional teaching methods or worthwhile is undetermined.

Although student academic performance improved, research on state standards alignment or mathematic concepts was limited. For this reasoning, the effectiveness of PBE was not fully communicated. Further PBE studies should focus on the effectiveness of PBE programs on state standardized performance. Also, alignment with state standards needs further attention. A suggestion for future PBE meta-analysis work is assemble a more homogenous sample of PBE protocols for better interpretation and evidence of PBE programs.

Interdependency among community, investment, and curriculum formed a collaboration of stakeholders in education (See Figure 2) as gathered qualitative research articles. These themes solidified a sense of connectedness and empowerment where benefits were mutually exclusive. The qualitative literature suggests that place-based projects revitalize the community and create employment opportunities. Literature also suggests that teachers feel more confident in their ability to implement PBE projects thus becoming empowered pedagogically as well as psychologically. Also, the research indicates that teachers' attitude in the community shifted. Teachers made greater consumer choices and were more involved in local activities. As a result, students took ownership of their education. As stakeholders in education, literature indicates a synergetic bond was created among the community, teachers, and students.

Fig. 2 *Themed Place-based Model*



Qualitative themes support learning within the community has impacted student knowledge and skills in two areas: confidence and retention. Students assuming ownership of their education has created a sense of independency and leadership. Literature indicates students are more motivated to work with community members and respect peers with special needs. A participatory attitude ruptured, strengthening student communication and problem-solving skills. Confidence played a vital role in student academic success.

The qualitative theme of connectedness implies retainability also impacted student learning. Learning within the community gave students first-hand experiences; a sense of attachment to the community in which they dwelled. Students felt their learning served a purpose. Students were more engaged to pay attention and apply effort since their family, friends and neighbors served as the community audience.

CHAPTER III

TEACHERS' CONCEPTIONS OF PLACE-BASED PEDAGOGIES IN HIGH SCHOOL-MATHEMATICS CURRICULUM

A recent report ruled teacher quality was a key determinant of student achievement and possessing a strong content knowledge as a factor of effective teaching (Massachusetts's Department of Elementary and Secondary Education, 2009). Organizing or reorganizing math curricula has not automatically produced positive student outcomes; instruction delivery must be addressed prior to instruction (Witzel & Riccomini, 2007). The notion of doing more of the same has not proven to be a viable solution to improving students' math skills (Stone et al., 2008).

Policy makers have shifted from designing controls to designing systems to develop the capacity of schools and teachers with greater focus on accountability for student learning thus responsive notion to student and community needs (Darling-Hammond, 1997). In the era of high stakes with legislation such as NCLB, students are expected to develop conceptual understanding as well as apply their knowledge to a real-world context. Solving "word" problems effectively has been a relentless, challenging experience for students (Manzo, 1975) yet is ranked as a lower priority nationally (Gainsburg 2008; Manzo, 1975).

Literature Review

The Promise of Place-based Education

Placed-based education (PBE) progressively emerged as an alternative to traditional schooling where students were grounded in local issues and experience full-body learning in their community (Smith, 2002). Place-based learning deviates from class practices which involves rote, minimalist norms where opportunities of cognitive reflection of individual meanings among culture and place are nonexistent (Gruenewald, 2003). Originating in rural areas with limited resources, PBE has expanded to urban communities and transcended through various grade levels and an array of subject/concepts such as social studies, biodiversity, ecology, topography, local soil, water quality history, geography, language arts, reading, and mathematics. Placed-based learning is accomplished through experiential learning where the benefits exceed beyond a euphoric "feel good" moment (Gonsalves, 2010).

Active participation in place-conscious curriculum increases the likelihood of students developing "real-world" skills by working on projects of value to the community (Powers, 2004). Relevant, explicit practice and participation for a well-defined purpose enable students to develop these transferable skills. Students are compelled to assume a more active role in their education through inquiry methods of learning, reflective writing/expression, problem-solving, minimum direct instruction, and communication.

Learning in local venues acts as "anchors of place" where students engage in deeper thinking to form an attachment with the learning setting. Place attachment encompasses the cognitive (knowledge as place meaning), affective (place attachment; attitudes and preferences as place meanings) and psychomotor domains of learning (learned or performed kinesthetic skills in specific physical places) (Semken & Freeman, 2008).

These places become mnemonic devices for students to recall key insights held (Emekauwa & Williams, 2004; Lewicki, 2000) where learning is more readily accessible and applicable to their world. One finding of PBE impact on standardized tests found leaps in higher-order thinking skills of evaluating, analyzing, and interpretation after comparing pre and posttest scores (Lewicki, 2000).

Substantive content learning is attainable when students are pushed to investigate topics of local relevance through inquiry methods (Buxton, 2010; Rahm, 2002; Warren et al., 2001). Active learning-or also experiential learning-includes dialogic, hands-on opportunities where students articulate their insight during and post investigation. Baker (1990) investigated the outcomes of REAL based enterprises on student learning, where she found useful entrepreneur skills made significant contributions to the community post-graduation.

Place-based education (PBE) aims to build place-conscious through experiencing, exploring discovering, and analyzing dimensions of place in the natural environment. Smith (2002) described PBE as an infuse of traditional education process with curricula designed to utilize the community as a classroom. Several researchers have argued that instructional practices that scaffold learners to investigate and apply inquiry methods could result in substantial learning outcomes (Buxton, 2010; Rahm, 2002; Warren, Ballenger, Ogonowski, Rosebery, & Hudicourt-Barnes, 2001). Low achievement in mathematics has been associated with student disengagement shared feelings of subject irrelevance to life after high school (National Council of Teachers of Mathematics (NCTM), 2000).

Research has shown that PBE is complementary with a standards driven curriculum when curriculum developers' diverse perspectives are honored and explicit goals are defined (Jennings, Siwdler, & Koliba, 2005). With multi-disciplinary capabilities, learners are able to build connection between rudimentary and larger concepts. Educator development and collaboration of mathematical, explicit connections have proven to enhance student achievement (Stevens, Harris, Aguirre-Munoz, & Cobbs, 2009). Preservice or experienced teachers sustain a distorted vision of the proposed frameworks for reform, without received effective training from reformer advocates to develop the knowledge and skills, and then practice putting this training to use (Lampert & Ball, 1999).

Methodology

Participants

Three former/active mathematics teachers were conveniently selected based on the study location and relevance of the study content. Participant 1 was a Korean female with seven years of mathematics teaching experience in Korea. She was a former mathematics teacher currently enrolled as a full-time doctoral student. Participant 2 and 3 both actively serve dual roles, as a mathematics teacher and athletic coach. Participant 2 was a male, Hispanic American with one year of educator field experience while participant 3 was a Caucasian male with 11 years field experience. Collectively, all participants have 19 years of experience total as mathematics teachers.

Research Design and Procedures

Procedures outlined by Denzin and Lincoln (2003) were executed during this study. Such procedures included devising a central question, selecting a number of participants, gauging a reasonable period of time in which to undertake the study, and employing data collecting strategies most suitable to the study (Denzin & Lincoln, 2003). The central question, "What are teachers' conceptions of place-based pedagogy in high school, math curriculum?", guided the study.

Interviewing served as the primary protocol during the investigation. Each interview was structurally designed where a tentative list of questions guided the dialogue (see Appendix). The interviewing of participants was approved by the Institutional Review Board. Prior to the interview, participants were pre-exposed to the interview protocol. Interviews were conducted over a two-month period and lasted a range of 15-20 minutes.

After participants acceded, they responded to subquestions which derived from the central question "What are teachers' conceptions of place-based pedagogy in high school, math curriculum? The progressive questioning strategy aimed to establish a receptive environment for participants. Interviews were audio recorded then transcribed.

Data Analysis

Once transcriptions were finalized, the researcher employed constant-comparative analysis techniques. When applying the technique, the researcher read the data numerous times to extract salient quotes or statements that describe the essence of the central question. As the researcher read the data repeatedly and thoroughly, the subquestion helped emerge commonalties among the participant responses. These salient quotes or statements were organized into clusters of meanings that collapsed called themes. Themes were illustrated structurally, where participant explanations depicted the context, condition, or situations of the central question (Creswell, 2007). Some initial themes collapsed into emergent themes to solidify high school teachers' conceptions of place-based pedagogy.

Results

Five themes emerged from the central question, "What are teachers' conceptions of place-based pedagogy in high school, math curriculum?" The themes included: A literal response, curriculum constraints, measuring tools for learning, unfamiliarity with researched practices, and leadership pioneers. Literal response referred to participant ideologues that were direct and relatable. Curriculum constraints referred to an operating set of restrictions on the courses taught. Tools for learning referred to the difficulty in assessing students when using a place-based pedagogical approach. Unfamiliarity indicated a teacher's lack of knowledge concerning place-based curriculum. Leadership pioneers emerged as teachers discussed the role of administrators in their schools as the endorses of the use of this pedagogy.

Theme 1: A Literal Response

Participant ideologues about place-based pedagogy were direct and relatable, hence a literal response. A common thread of interviewee responses believed placed-based education provided society exposure of multi-subject areas. "[Place-based] takes [students] to show them when they will use [mathematics] and why" innumerable concepts are learned across disciplines. A pure interdisciplinary approach, consensus among the participants was that place-based captured the business and professional side of mathematics application. "[Place-based pedagogy] definitely opens a lot... goes back and connects with the kids...what they like and understand." An interviewee quoted "they always ask when I am going to use this stuff? This would be a great opportunity" to depict the application of mathematics outside of the traditional, four-wall mathematics classroom.

"People are only familiar with what their parents do [or] grandparents do" and fail to realize "there's more out there they never get a chance to see; other than what they know." Place-based pedagogy enables students to prepare and expose real-contextual experiences, "that they're going to need." Teachers aim to build critical thinkers, "learn how to analyze and synthesis what they have learned.

The term fieldtrip was used synonymously to describe place-based sites of learning. Setting the expectation was paramount for students to learn and gain something from the exposure where students sense "People are really using this stuff and understand how mathematics is used. " Teachers felt students would receive "a lot of good teaching and hands-on teaching" from PBE opportunities.

Place-based opportunities "relate back to the kids" a participant described. "Using what is here in their community and apply[ing] what they know to mathematics through their experiences through learning." The participant continues to explain if real-world context applications does not relate back to the students, then transferability thus applicability will be weakened. "Kids can't connect back if [applications] are above their level; lack of understanding may cause a lack of interest." Finding mutual experiences so students can "make sense of what [mathematics] actually signifies is the challenge proposed."

Also, place-based provides an opportunity to heighten student awareness. Some of the place-based projects suggested by participants included town elections, communal professions (e.g. grocery store managers, architects), and synthesizing mathematics with fields like physics and engineering. Participants stated finding "trigonometric functions to measure the width of the rivers." An interviewee commented "bringing in some professions [that are] math based that kids don't know." He continues "Seeing what it means for the store to lose money or gain money…and how sales are affected" is beneficial to student learning and building connections. Visiting community sites provides an opportunity to see the physical theories of various disciplines and develop connections. A participant highlighted "having guest speakers to come in and talk to our kids about math from the community" could spark interest. Another participant shared "companies in town donate financially but also maybe they can donate time and explain what they do."

Theme 2: Curriculum Constraints

Participants concurred that placed based imposed an operating set of curricular practices and suggested possible constraints. High schools customarily follow a school-wide bell schedule usually approximating 50 minutes to 2 hours of consecutive instruction ranging from 4 to 7 class periods daily. Participants perceived the bell schedule as problematic in three distinct areas: transportation, extracurricular activities, and time.

Participants expressed some apprehension with covering a place-based curriculum aside from their present curriculum, “not enough time to cover every chapter. It’s always a tight schedule in curriculum.” The mutual concern stemmed from time outside the classroom which they believed would barricade when covering the curriculum as a whole. As an alternative, an interviewee proposed to schedule place-based activities “once every six weeks or once a month”, an argument to start with a low frequency and then gradually increase place-based experiences. Another interest was the degree of transportation demanded for class size.

“Transportation is always an issue and a cost” expressed the coaches. A coach justified his concerns about the economic cost of providing transportation for students, “Just coming from the practical side as a coach, logistics and cost are always governing [factors].” Teachers expressed concerned about transporting each class to the site and/or scheduling due to the school-wide adopted bell schedule. Reluctantly a participant stated “it could work maybe on a small scale first than grow from there.”

Extracurricular activities and sports are embedded in the high school culture. At maximum, students may be active in both, a club and athletics, which are usually scheduled during the day. Place-based experiences may be hindered for students that belong to either since a possible scheduling conflict exists. The coaches expressed the standard schedule could be affected by place-based activities if students needed to relocate to a site. An interviewee commented “it would be really hard for kids to get to the site...and we didn't have a bus." Scheduling may impose a conflict for students involved in sports or other activities.

Theme 3: Measuring Tool for Learning

Tools to assess student learning was a concern for a participant. "How do [you] measure if students really are learning?" was another concern. One participant supported his concern, "getting [learners] in the habit of analyzing, evaluating, or discussing " so place-based sites "or not a typical field may take some time." Teachers would need to set the expectation for place-based opportunities.

Prior to submerging curricular practices into place-based pedagogy, teachers' view a preliminary knowledge of concepts is needed before thinking critically at a higher level. Enjoying learning becomes contagious where "[students] want to investigate more, ask more questions, and talk about things [with] their peers". Training students to think critically, analyzing or evaluating or discussing is a part of the process of attaining higher-level cognition.

Theme 4: Unfamiliarity with Researched Practices

Both active teachers expressed that terminology related to place-based pedagogy was unfamiliar. Participants articulated a need for more resources and literature as imperative to implementing place-based competencies. A participant shared that teachers may lack hands-on experiences in other fields thus they may need to get the expertise of a more varied professionals to strengthen the practical applications for students.

Observing some previous projects and receiving literature (i.e. of brevity) was essential to place-based implementation. Hand-on learning seemed to be the preferred learning approach to this pedagogy such as demonstrations and experiments enabling teachers to develop their own after the initial launch.

Theme 5: Leadership Pioneers

Leadership pioneers decried the extent of PBE influence and responsibility in which participants felt leaders could engage. Leadership support was also conductive to a successful place-based project launch or ongoing implementation. A participant suggested along with encouragement, leaders (comprised of principals, assistant principals, department chairs, and team leaders) should start by building relationships in the community and/or setting up and coordinating potential site setups. One said "working with the community and have several sites setup" to model the expectations students should be pushed toward. Participants viewed initial connections a primary responsibility of school leadership. One commented "they could facilitate (e.g. publicizing) and coordinate the sites". Financial backing and underwriting was also a way school leadership could support place-based opportunities. Augmenting the budget to relive funds was definitely a leadership/administrative (district and school level) responsibility from the teachers' perspectives.

Discussion and Recommendations

The evidence gathered from the interviews suggest that teachers are engaged with the philosophies of place-based pedagogy; however, feel uncertain of the practicality of its implementation in their high schools. From the participants responses gathered, incorporating PBE projects would impact student achievement, similar to Lewicki (2000) findings. Apprehension sensed from participants derived from a lack of PBE knowledge. Lampert and Ball (1999) argued preservice or experienced teachers sustain a distorted vision of the proposed frameworks for reform, without receiving effective training to develop the skills and knowledge to put into practice. The research suggests apprehension is attributable from fragmented knowledge or insufficient PBE exposure. Perhaps, teachers' conceptions of PBE may possibly be more enhanced by interviewing teachers that have served as PBE, high school facilitators. Further research in this area is needed.

CHAPTER IV

CONCLUSION

In retrospect, the intent of this study aimed to investigate the utility of place-based pedagogies in curricular practices. This was accomplished by first investigating the relationship between PBE programs and student performance and secondly, exploring teacher conceptions of PBE in high school curriculum.

The standardized findings in the meta-analysis indicate a moderate strength exists between PBE programs and student achievement. However, a prominent effect on mathematics achievement singly, was not evident. This magnitude of strength is highly contingent upon teacher implementation. Savant PBE educators are the catalyst for student academic growth. Whether a PBE effect on student achievement far exceeds conventional teaching methods or worthwhile is undetermined.

Although student academic performance improved, research on state standards alignment or mathematic concepts was limited. For this reasoning, the effectiveness of PBE was not fully communicated. Further PBE studies should focus on the effectiveness of PBE programs on state standardized performance. Also, alignment with state standards needs further attention. A suggestion for future PBE meta-analysis work is to assemble a more homogenous sample of PBE protocols for better interpretation and evidence of PBE programs.

This second study was conducted to investigate the central question: What are teachers' conceptions of place-based pedagogy in high school, math curriculum? From the data gathered, teacher conceptions were summarized by: feasibility of implementation, curricular relevance and overall receptiveness.

Collectively, teachers were intrigued by introductory place-based terminology. The terminology was relatively new and unfamiliar to active teachers. As place-based competencies were elaborated, participants appeared to grasp the general idea; however, ideas expanded from the core of place-based pedagogy interpreted the information differently. Active teachers viewed place-based education as a separate entity of curriculum practice instead of an integrated approach. They viewed placed-based education as an "extra" workload to their countless roles and responsibilities. Although the participants were receptive to the "idea" of place-based pedagogy, they viewed projects associated with the pedagogy as short termed and space as minimal. The bulk of their ideas concentrated around literal, verbal articulations of learning, for example viewing or analyzing videos, hearing a public speaker, instead of more psychomotor activities.

Nevertheless, teachers felt holistically that place-based education was a useful reform especially for mathematics. Teachers conceived school leadership as in charge of initiating and coordinating community relationships and would rather the leadership in their schools or districts assume this responsibility for the initiation of these relationships. With ongoing, ample encouragement from school administrators, educators felt more willing and bolstered to implement place-based curriculum.

However, teachers' conceptions of place-based pedagogy are slightly inhibited. Greater dissemination of place-based literature, professional development and access are essential for implementation by active teachers. Preservice or experienced teachers sustain a distorted vision of the proposed frameworks for reform, without receiving effective training to develop the skills and knowledge to put into practice (Lampert & Ball, 1999). Further evidence is needed to infer how or why teachers lack knowledge of placed-based education and if a more complementary audience exists for the curriculum reform.

The utilities of place-based education are inherently multidisciplinary (Smith & Girod, 2003); therefore, mathematic cognition does not have a direct impact on this pedagogy. More sophisticated mathematics does not appear to have a place in place-based education from a research standpoint; however teachers' conceptions feel inversely. Further research is needed from high school teachers that have implemented place-based competencies to infer their perceptions of the level of mathematics cognition gained from implementing this pedagogy. From the evidence presented in this study, I conclude that place-based pedagogies cater more toward fundamental mathematic skills (e.g. measurement, number sense). However, discourse from teachers solidified that place-based education serves as a general effective tool for student engagement and real-world context of how mathematics functions in society, at a pure surface level of understanding.

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APPENDIX

Interview Protocol

Project Title: Teachers' Conceptions of Place-based Pedagogies in High School, Math Curriculum

Central Question: What are teachers' conceptions of place-based pedagogy in high school, math curriculum?

Sub-questions:

Preliminary Questions

1) How long have you been a teacher?
2) What motivated you to decide to become a teacher?
3) How long have you taught in this school? What courses have you taught?

Questions Pertinent to Study

4) Often, real-world context is a common term used in mathematics education. What do you think "real-world context" means in math education?
5) A NCTM [define, some teachers may not know what this is] Connection standard reads "recognize and apply mathematics in contexts outside of mathematics." What are some examples of how this statement has been achieved in courses you have taught?
6) A term that is often used to describe certain approaches to teaching is "place-based pedagogies."(Synonymous with service learning, community-oriented learning, and ecological education) Have you ever heard of this term?

- If not, it means learning through participation in service for the local community. Students are immersed in the local heritages, cultures, landscapes, opportunities and experiences.
    - What are some ways place-based pedagogy could be implemented in high school classrooms?
- If they have heard of it, ask what does it mean to you?
    - How have you implemented (or would) you implement placed-based pedagogy in your high school classroom?

7) What do you think might be some barriers to implementing placed-based pedagogies in your classes?
8) What do you think your school's leadership can do to assist teachers in applying real world context in their classes?
9) What professional development opportunities do you feel would support more real-world context in high school math curriculum?

VITA

Nikeitha Lynn Brown earned her Bachelor of Science degree in academics studies with a minor in mathematics from Sam Houston State University in Fall 2006. Four years later, she entered the Curriculum & Instruction program at Texas A&M University in Fall 2010. Her research interests include mathematics education, preservice teacher development, and counseling at-risk students. She graduated from Texas A&M University in December 2011. When appropriate time is allotted, Nikeitha will write an autobiography of her life experiences. Upon post-graduation, Nikeitha plans to continue to explore roles that suit her strengths as well as find her passion.

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